Managerial Economics
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Lecture - 67
Oligopoly (Contd…)

We will continue our discussion on collusive Oligopoly model in this session also. So, if you remember, in the last session, we talked about the different kinds of collusion and primarily there are two types of collusion; one is explicit collusion and other is tacit collusion. And one of the most common form of explicit collusion is cartel, and cartel is generally a joint agreement among the Oligopoly's firms to maximize the profit, and here generally the central agency decides the price and output.

There are two major types of cartel; one is cartel maximizing at joint profit, centralized cartel and second type of cartel is market sharing cartel. And again market sharing cartel here comes in two forms; one is on the basis of market sharing on the basis of non-price competition, and secondly the market share on the basis of quota. If you look at, the cartel is sustainable and there are some prerequisite to form the cartel also and this is this will this is going to be sustainable if all the firms, they are producing homogeneous product. And if you look at all the firms, they are producing homogeneous products and that gives the scope at least to follow a uniform price, whatever is whatever is followed by the a cartel or whatever is the cartel price, that becomes easy to follow by all the firms.

So, today, we will discuss on the other form of collusive model that is other form of collusive model that is price leadership. Here, we will discuss the price leadership model in three contexts; one is when the price leadership is price is decided by low cost firm, when price is decided by a dominant firm and when the price is decided by the by the barometric firm.

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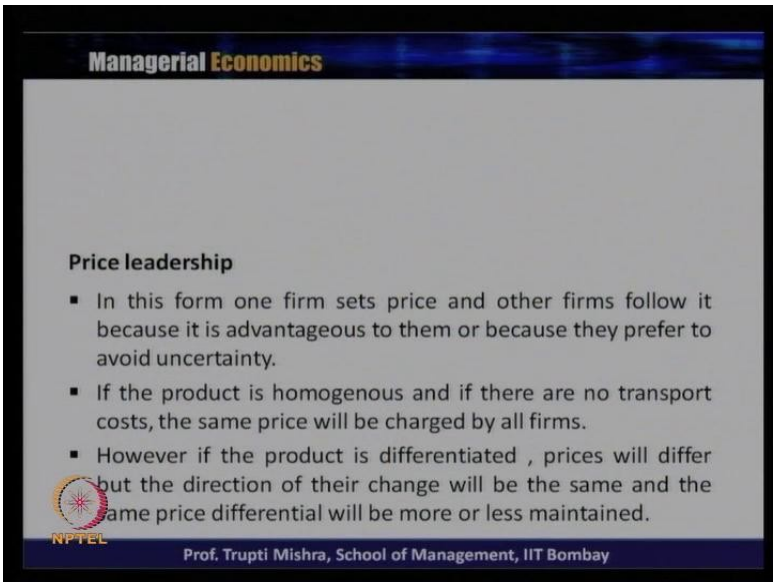

So, to start with, we will know what is price leadership first. So, it is a firm where one firm sets price, other firms follow it because it is advantageous to them or because they prefer to avoid uncertainty. So, if you look at the collusion, the major objective is to avoid the uncertainty; uncertainty in terms of getting the profit, uncertainty in term of being in the market or sustain in the market.

So, in case of price leadership, one firm set the price and other firm just follows it because they feel that, by following this price they are getting some amount of profit and there is no uncertainty associated with what kind of profit they are going to get. If the product is homogeneous and if there are no transport costs, the same price will be charged by all the firms because product is homogeneous, no transport cost to assume that all the cost of production comes within a identical frame, and whatever the price follow price decided by the one firm, generally that is acceptable to all. But if there is a transport cost or if the product are not homogeneous, may be that time whatever the price decided by the one firm, that may not be followed by the others; however, if the product is differentiated, prices will differ, but the direction of their change will be same and the same price difference will be more or less maintained.

So, how they tackle with the price if the product is differentiated? Initially, they will initially they will fix up the price of all the products, but they will control their direction of change. If it is going to increase, if it is going to decrease, they will give a range and in that range only the price is to increase or the price is to decrease. if it is homogeneous product they have to charge a cost and price same price for all the products, but if it is a differential product or if it

is a heterogeneous product, in this case, they will fix up the price at once and the direction of the change of the price has to be controlled by the firm which decides the price. So, in this case, the same price differential is going to maintain more or less for all this category of the product, when it is a heterogeneous product in the market.

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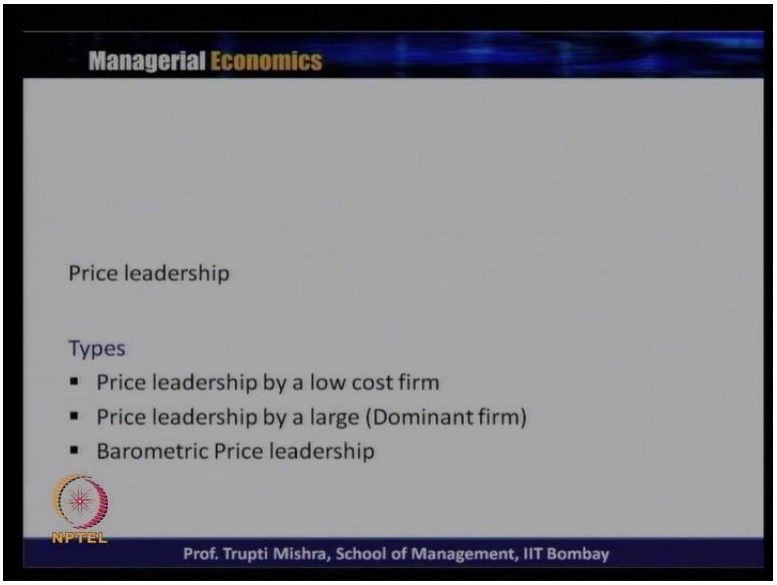

So, we will discuss three types of price leadership: one is price leadership by low cost firm, second one is the price leadership by a large dominant firm, and third one is the barometric price leadership. To start with, when we talk about the price leadership of a low cost firm, let us know what can be a low cost firm and why we call it low cost firm.

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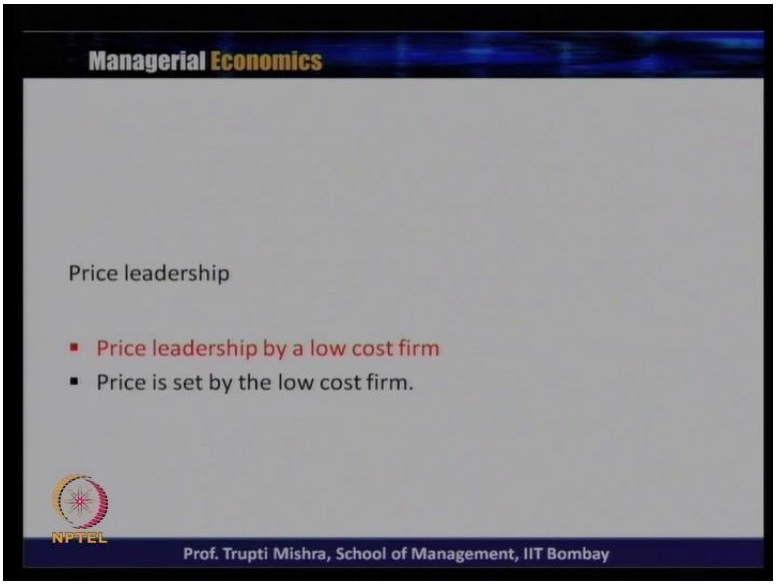

Low cost firm is one where the cost of production is less to produce the product. There may be number of possibilities that why firms get into or how come firms reach to a situation

where they become the low cost firm. The basic argument for this goes that, if it is large firm and the scale of operation is more, then in the long run the per unit cost decreases and they emerge as a low cost firm.

Second, again if it is a mass production, again the same reason. If it is a mass production, large scale, in the long run generally they get into a situation where the per unit cost decreases, goes on decreases; they reached the minimum and then it increases. So, low cost firm is one firm which generally lies in the decreasing portion of the long run average cost curve till the time it is reaching to the minimum cost.

So, to produce the same product, if there are number of firms in the market if one firm is producing that at a lower cost of production as compared to other, as compared to the other firm, generally they are known as the low cost firm and they are low cost firm may be because of economy of scale. And again, if you want to specifically find out a reason, may be efficiency of raw material, efficiency of inputs, efficiency of technology, efficiency of the man power involved in the production process, they become they make the firm become the low cost firm.

Now, if the low cost firm generally decides the price in a market in one kind of price leadership model, we find that the low cost firm decides the price. If the low cost firm decides the price, let us find out graphically and also numerically that how the outcome is on the other firms in the market or why the low cost firm is being chosen as the price leader, particularly in this type of market or in this type of arrangement of collusive model; collusive model of Oligopoly.

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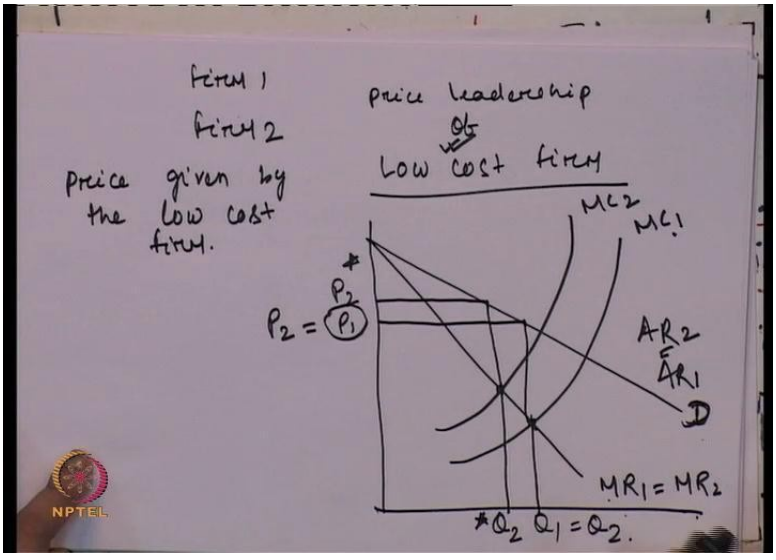

So, we will see the price leadership of low cost firm. So, we will take the demand curve; we assume there are mainly two firms: one is firm 1; another is firm 2. So, we will, we will take the demand curve as average revenue 1 and also average revenue 2, and this is in the this is shown in the form of the demand curve. We will take the marginal revenue curve that is MR 1 equal to MR 2. We will take cost function; we will take separate cost function for both the firms. So, one, we have is marginal cost 1, and second we have the marginal cost 2.

So, we have taken the demand curve where this is the average revenue curve of firm 1 and also equal to the average revenue curve of firm 2. We have taken the marginal revenue curve in the form of MR where MR 1 is equal to MR 2. We have taken two separate cost functions because here the leadership comes in the form of the low cost firm. So, MC 1 is the cost function for firm 1 and MC 2 is the cost function for firm 2.

Now, to find out what is the price to be followed, we get one point here where marginal revenue 1 and marginal revenue marginal revenue 1 intersect the marginal cost of firm 1 and we get a price which is equal to… Maybe we can this is marginal revenue 1, so here we will get a price which is equal to P_1 and correspondingly, also we will get a price level taking the point where MR 2 is equal to MC 2; we get one more price that is P_2. Let us call it $P_2^{¿}$.

Now, what is the thumb rule here? Since the price leadership is by the low cost firm, both the firms, they have to accept the price which is given by the low cost firm price given by the low cost firm. And what is the price given by the low cost firm? That is P_1; so ideally, this P_1 should be equal to also P_2. So, this is the price since firm 1 is the low cost firm and according to the low cost firm cost function, we take the MC 1 is equal to MR 1. Corresponding to that, we get the price which is equal to P_1 and also we get the quantity which is equal to Q_1 and this is the price; firm 2, they have to also follow it because they have accepted low cost firm as the price leader, and they are going to produce $Q_2^{¿}$. Ideally, they should produce $Q_2^{¿}$ when the price is P_2, but since they are following this price given by firm 1, they are also producing the output that is Q_1 is equal to Q_2.

Now, if you look at the price is given by the low cost firm; that is why this is lower. corresponding to firm 1, we have firm 2 which is having a higher cost function and if higher cost function, if their price is being charged on the basis of higher cost function ideally the price should be $P_2^{¿}$, but since they have accepted this firm 1 as the low cost firm and they

have to be the price taker, in this case they will take a price which is equal to P_1 and they will produce; that is Q_1. But ideally what is their profit maximizing model? Profit maximizing model is they will produce less, but they will charge a higher price in order to produce it.

So, when the price is given by the low cost firm, the high cost firm, they have to accept it, but in the long run, if the price is going to be continuously lowest as compared to their profit maximizing price, they may not accept the firm as the leader and they will they will not into be the collusion; they will go out of the collusion and they will independently charge their price on the basis their profit maximizing level of output. Because they will feel that continuously in the long run also, if they are charging a price which is much lower to their cost function or much lower to their market price, what it would have been on their profit maximizing level, then in that case they will go out of the collusion and they will charge independently their price.

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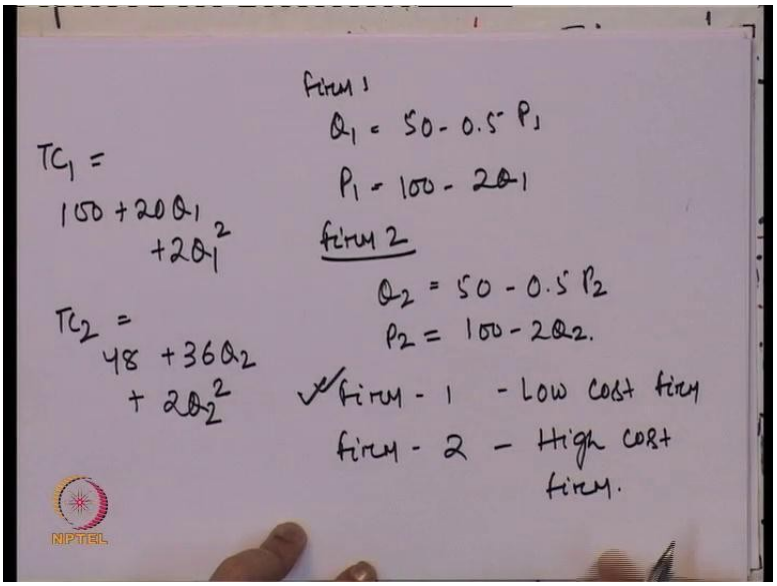

Now, we will just take a numerical to understand this price leadership by the low cost firm. So, we will get two demand functions that is $Q_1 = 50 - 0.5\,P_1$; $P_1 = 100 - 2\,Q_1$. This is for firm1. Then we look for firm 2. So, for firm 2 $Q_2 = 50 - 0.5\,P_2$ and from here we can find out this $P_2 = 100 - 2\,Q_2$.

Then we will take the cost function $TC_1 = 100 + 20\,Q_1 + 2\,Q_1^2$ and $TC_2 = 48 + 36\,Q_2 + 2\,Q_2^2$. So, $Q_2 = 50 - 0.5\,P_2$. $P_2 = 100 - 2\,Q_2$; this is for firm 2; this is for firm 1. So, here firm 1 is the low

cost firm and firm 2 is high cost firm. So, ideally the price has to set by the low cost firm and that has to be followed by the high cost firm in order to operate in the market.

To find out the price on the basis of low cost firm what we have to do? We need to find out the marginal revenue 1 with respect to firm 1. We need to find out the marginal cost for firm one and we will equalize the marginal revenue marginal cost in order to get the profit maximizing level of output and profit maximizing level of price, and that price has to be accepted by firm two. Then we will find out the price with respect to firm two and we will find that whether that is the same amount of profit that they are getting if they are charging the price on their own.

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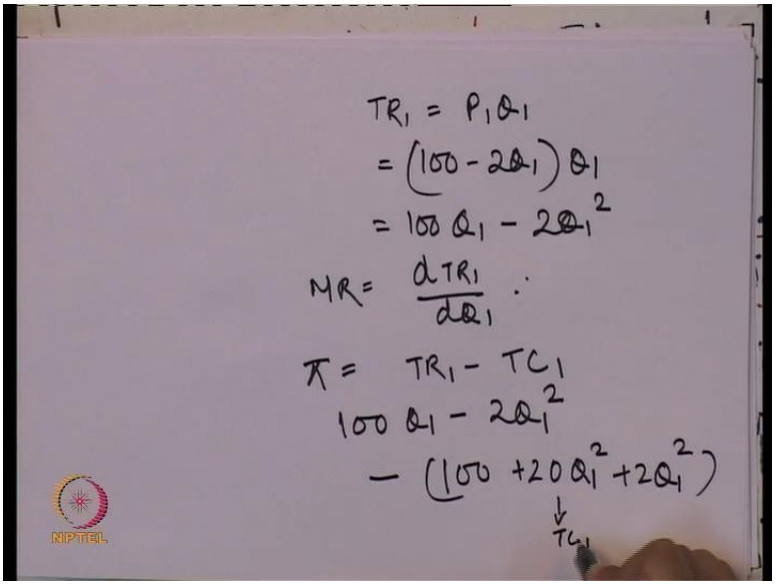
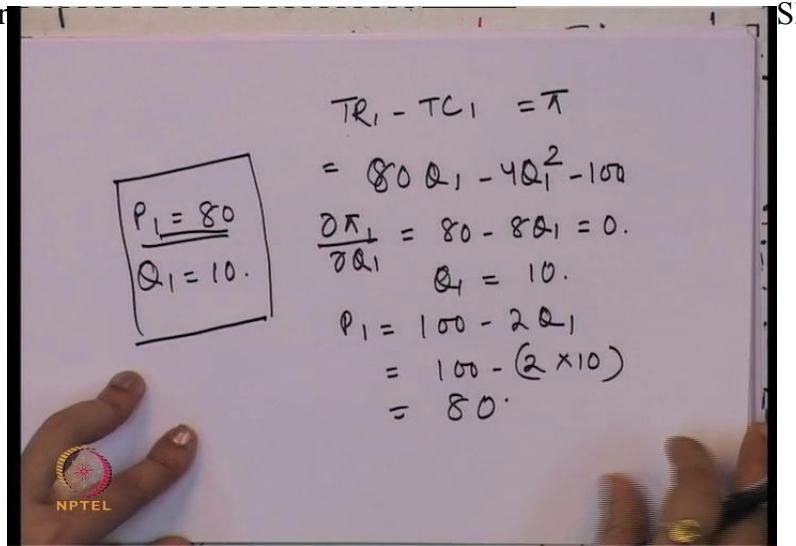


So, to find this marginal revenue and marginal cost, we will find out the total revenue 1 $TR_1 = P_1Q_1$. So, $TR_1 = (100 - 2Q_1)Q_1$. So, that comes to $100Q_1 - 2Q_1^2$ marginal revenue we will take as $R_1 = \frac{dTR_1}{dQ_1}$. So, that will continue or maybe we can find out the profit. Profit is $\pi = TR_1 - TC_1$; so $\pi = 100Q_1 - 2Q_1^2 - (100 + 20Q_1^2 + 2Q_1^2)$, So, this is our total cost. So, this is total cost 1.(Refer Slide Time: 15:40)



Now, we will if we simplify this. We will get total revenue minus total cost 1 in order to get profit. So, this will be, if you multiply this, if you deduct this total revenue 1 from total cost 1, then we get $\pi = 80Q_1 - 4Q_1^2 - 100$. And we will take the first order derivative in order to find out the profit and in order to find out the profit price and output. So, that will become $\frac{d\pi}{dQ_1} = 80 - 8Q_1 = 0$ and Q_1 is equal to 10. So, if Q_1 is equal to 10, $P_1 = 100 - 2Q_1$; so $P_1 = 100 - 2(10) = 80$;. So, P_1 is equal to 80; Q_1 is equal to 10; that is, if the price is decided on the basis of the low cost firm, P_1 has to be equal to 80.

Now, we will find out for firm two and we will see whether if they are following their profit maximizing formula, whether they are also getting the same amount of price or they are getting a different price.

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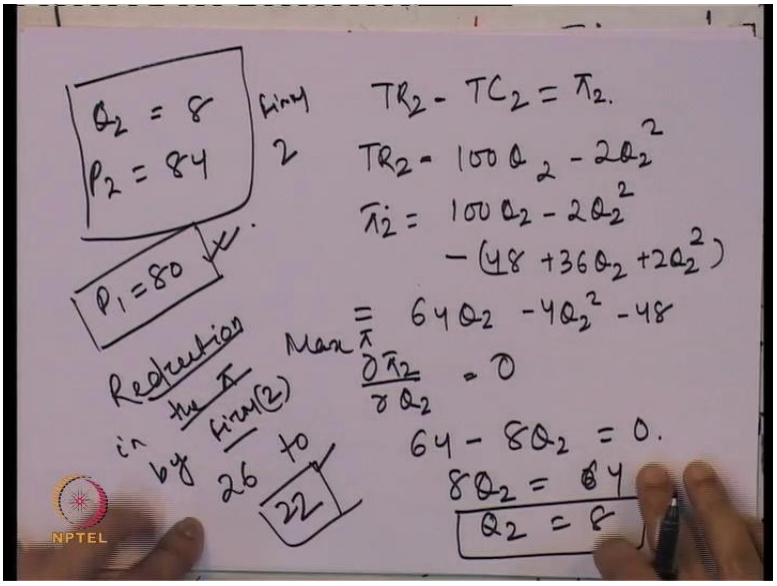

So, to find this, we need to get the total revenue 2 and total cost 2 because that will give us the profit. So, total revenue 2 is equal to $TR_2 = 100Q_2 - 2Q_2^2$ and $\pi_2 = 100Q_2 - 2Q_2^2 - TC_2$. So, that is $TC_2 = 48 + 36Q_2 + 2Q_2^2$. So, if we simplify this, we get $\pi_2 = 64Q_2 - 4Q_2^2 - 48$, and we will take the derivative in order to get the price and output; so that has to be equal to 0. To maximize pi, we need to take this first order derivative equal to 0.

So, what is the first order derivative? That is $\frac{d\pi}{dQ_2} = 64 - 8Q_2 = 0$. So, $8Q_2 = 64, Q_2 = 8$. This is the output for the firm 2. If you put the value of $Q_2 = 8$, we will get $P_2 = 84$. So, this is if the

profit maximizing level on the basis of the firm 1. So, firm 2. So, this is the price and quantity if firm 2 decides what should be the price and quantity.

Since this is a low cost firm, we will take price is equal to 80 because this is the collusion that the low cost firm will decide the price and the outcome for this is that the $P_1 = 80$ is going to be followed in the market. If $P_1 = 80$ followed in the market, what is the outcome? Outcome is there is a reduction in the profit by reduction in the profit by firm 2. And what will be the reduction? If you calculate the profit by taking the price 80 and 84, the profit will reduce from 26 to 22. So, this is the outcome; the reduction in the profit is the outcome for the firm 2, if they are following a low cost firm.

But here if you look at, what is the arrangement? The arrangement is that low cost firm has to follow the high cost firm has to follow that, whatever the price decided by the low cost firm. Because when they are getting into an agreement, they are colluding to get may be the market share or to maximize the joint profit, the agreement is that the low cost firm has to decide the price.